User's Manual for
ETM131

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1. Introduction

Embin's **ETM131** is a Serial to Ethernet Converter module with 8051. **ETM131** can be used extensively to read the data over the serial port and send the data via Ethernet in the packets format. At the heart of the board is Phillips P89C51RD2/P89C668; this provides advance features like ISP. The micro controller has 64KB flash memory and 1KB/8KB on-chip RAM. The Module board comes with RS-232 interface to allow user to program the micro controller directly from PC. **ETM131** board reads the data from any Serial Port and sends to the Ethernet (LAN).

ETM131 is a unique hardware and software combination providing the serial data send through the Ethernet. Hardware reference and software application programs also simplify 8051 based hardware and software development. This board is also having the facility of Software flow control or Hardware flow control and No flow control, you can select the Software flow control or Hardware flow control or no flow control option through the CONFIG menu. SERIAL BUFFSIZE is 100bytes, so without S/W or H/W flow control we can transfer the 100bytes at a time with out data loss. The time gape between two transmissions should be approximately 5msec. TCP packet size is 140bytes. Before stating the data transfer the remote system, which is collecting the data, should be on, otherwise the data may loss. In the ETM131 no feature of checking whether remote system is connected or not.

Peripherals:

- Ethernet connectivity.
- Serial EEPROM.
- RS232 Serial Interface.

1.1 **Ethernet card connectivity:** To connect the Microcontroller to transfer the data from Microcontroller to the Ethernet RTL8019AS is used in **ETM131**. Ethernet connectivity is the main feature of **ETM131.** So that one can use it according to the need. RTL8019AS is connected to the Microcontroller through the port0 and port2. In ETM131 RTL8019 we have used in 8bit mode in interrupt mode. The fallowing are the features of the RTL8019 if user wants to implement his own development he can implement on this features.

The RTL8019AS is a highly integrated Ethernet Controller. With the three level powers down control features, the RTL8019AS is made to be an ideal choice of the network device for a GREEN PC system. The full-duplex function enables simultaneously transmission and reception on the twisted-pair link to a full-duplex Ethernet switching hub. This feature not only increases the channel bandwidth from 10 to 20 Mbps but also avoids the performance-degrading problem due to the channel contention characteristics of the Ethernet CSMA/CD protocol. The Microsoft's Plug and Play function can relieve the users from pains of taking care the adapter's resource configurations such as IRQ, I/O, and memory address, etc. However, for special applications not to be used as a Plug and Play compatible device, the RTL8019AS also supports the jumper and proprietary jumper less options. To offer a fully *plug and play* solution, the RTL8019AS provides the auto-detect capability between the integrated 10BaseT transceiver, BNC and AUI interface. Besides, the 10BaseT transceiver can automatically correct the polarity error on its receiving pair. Furthermore, 8 IRQ lines and 16 I/O base address options are provided for grand resource configuration flexibility. The RTL8019AS supports 16k, 32k & 64k byte BROM and flash memory interface. It also offers the page mode function, which can

support up to 4M-byte BROM within only 16k-byte system memory space. Besides, the BROM disable command is provided to release the BROM memory space for other system usage (e.g. EMM386, etc.) after the BROM program is loaded. The RTL8019AS is built in with 16K-byte SRAM in a single chip. It is designed not only to provide more friendly functions but also to save the effort of SRAM sourcing and inventory.

Features of RTL8019AS:

1. 100-pin PQFP
2. RTL8019 software compatible
3. Supports PnP auto detect mode (RTL8019AS only)
4. Compliant to Ethernet II and IEEE802.3 10Base5, 10Base2, 10BaseT
5. Software compatible with NE2000 on both 8 and 16-bit slots
6. Supports both jumper and jumper less modes
7. Supports Microsoft's Plug and Play configuration for jumper less mode
8. Supports Full-Duplex Ethernet function to double channel bandwidth
9. Supports three level power down modes:
    - Sleep
    - Power down with internal clock running
    - Power down with internal clock halted
10. Built-in data prefetch function to improve performance
11. Supports UTP, AUI & BNC auto-detect (RTL8019AS only)
12. Supports auto polarity correction for 10BaseT
13. Support 8 IRQ lines
14. Supports 16 I/O base address options and extra I/O address fully decode mode (RTL8019AS only)
15. Supports 16K, 32K, 64K and 16K-page mode access to BROM (up to 256 pages with 16K bytes/page)
16. Supports BROM disable command to release memory after remote boot

17. Supports flash memory read/write (RTL8019AS only)
18. 16k byte SRAM built in (RTL8019AS only)
19. Use 9346 (64*16-bit EEPROM) to store resource configurations and ID parameters
20. Capable of programming blank 9346 on board for manufacturing convenience
21. Support 4 diagnostic LED pins with programmable outputs

1.4 Serial EEPROM: The AT24C512 provides 524,288 bits of serial electrically erasable and programmable read only memory (EEPROM) organized as 65,536 words of 8 bits each. In **ETM131** AT24C512 is connected to serially to Microcontroller at P1.6 and P1.7 (I2C bus for P89C668). This peripheral can be used in many industrial and commercial applications where low power and low voltage operation is essential.

Features of AT24C512:

1. Low-voltage and Standard-voltage Operation
   - 2.7 (VCC = 2.7V to 5.5V)
   - 1.8 (VCC = 1.8V to 3.6V)
2. Internally Organized 65,536 x 8
3. 2-wire Serial Interface
4. Schmitt Triggers, Filtered Inputs for Noise Suppression
5. Bi-directional Data Transfer Protocol
6. 1 MHz (5V), 400 kHz (2.7V) and 100 kHz (1.8V) Compatibility
7. Write Protect Pin for Hardware and Software Data Protection
8. 128-byte Page Write Mode (Partial Page Writes Allowed)
9. Self-timed Write Cycle (5 ms Max)
10. High Reliability
    - Endurance: 100,000 Write Cycles
    - Data Retention: 40 Years

2. Getting Started

2.1 ETM131 Includes:

ETM131 Package contents are:

- **ETM131** Board.
- Serial Cross Cable.
- Power Adaptor.
- System CD-ROM with Application programs.

2.2 Power Supply Requirements:

ETM131 Board is provided with +9Volts output adaptor with 230V AC input. The board has a +5Volts Regulator on-board, which provides supply to the entire device on the board.

2.3 Configuring the system:

Connect the Serial cable provided to the DB9 connector on **ETM131** board & COM1/COM2 of the Computer. Plug in the Power adaptor in 230VAC mains socket & connect the +9V pin of power adaptor to the **ETM131** board (CN1) the board is now ready to be switched on.

As soon as the reset switch S1 is pressed configuration mode is shown on the hyper terminal as "Please Enter for Configuration". At this point press "ENTER" key quickly to configure the system. Please follow according to the menu shown .

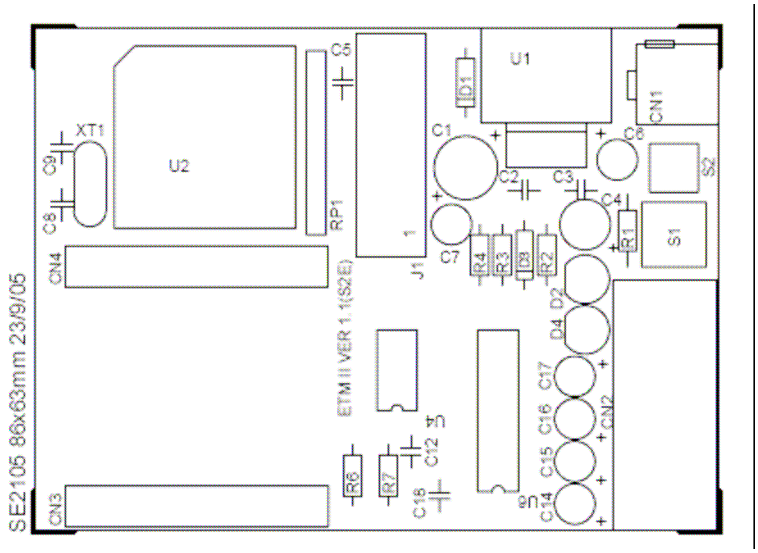
3. Board Description

- Philips 8-bit, 80C51-compatible P8xC51RD2 Microcontroller (DIP-40/PLCC-44, 12 MHz clock frequency)
- On-chip FLASH.
- 64KB on-chip FLASH with download utility for in-System (ISP) FLASH Programming. 1KB of on-chip RAM.
- 512KB external serial I2C-EEPROM.
- RS232 serial interface
- Ethernet Connector RJ45.
- Single 5V power supply.

4. Connector details and jumper settings

The **ETM131** board is available with Serial Connector and RJ45 for Ethernet data transfer through the microcontroller. Below Sections give the Board layout & Board Jumper Details.

4.1 ETM131 board Layout:



4.2 Connector & Jumper details of ETM131:

4.2.1 Port connector:

PORT0 :

CN3 Pin2 To 9 – P0.0 To P0.7

PORT1 Max-232:

P1.0 To Max pin9

P1.1 To Max pin10

PORT2 CN4:

CN4 Pin3 - P2.5
CN4 Pin4 - P2.7
CN4 Pin5 - P2.6
CN4 Pin7 - P2.0
CN4 Pin8 - P2.1
CN4 Pin9 - P2.2
CN4 Pin10 - P2.3
CN4 Pin11 - P2.4
CN4 Pin6 - P3.2

CN2 To MAX232:

CN2 – Pin2 To Pin13

CN2 – Pin3 To Pin14

CN2 - pin5 To Ground

CN2 - pin7 To Pin7

CN2 - pin8 To Pin8

CN1 power supply

Jumper Jp2

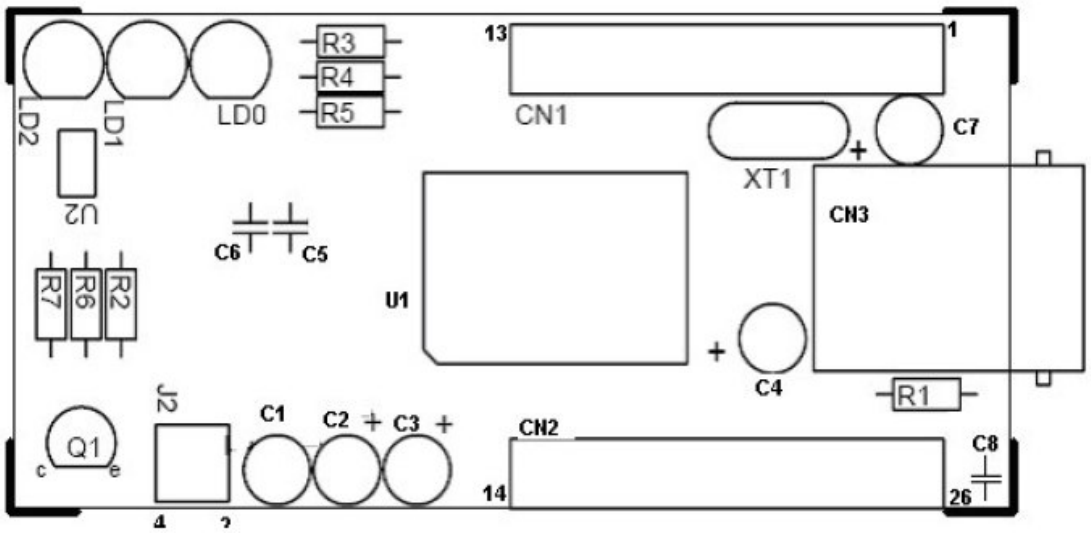
Pin 1- Pin 2 Closed: - Non Inverted Interrupt Signal

Pin 3- Pin 4 Closed: - Inverted Interrupt Signal (default)

J1 is for company use

CN3 of base board to CN1 of upper board
CN4 of base board to CN2 of upper board

Upper board Layout :



RJ45 (CN5) To 8019:

P1 To Pin45
P2 To Pin46
P3 To Pin59
P4 To Ground
P6 To Pin58
P7 To Ground

CN1 to base board CN3

CN1-1 NC
CN1-2 SD0 Data Bus
CN1-3 SD1 Data Bus
CN1-4 SD2 Data Bus
CN1-5 SD3 Data Bus
CN1-6 SD4 Data Bus
CN1-7 SD5 Data Bus
CN1-8 SD6 Data Bus
CN1-9 SD7 Data Bus

CN2 to base board CN4

CN2-1 Vcc
CN2-2 SD0 Address Bus
CN2-3 SD1 Address Bus
CN2-4 SD2 Address Bus
CN2-5 SD3 Address Bus
CN2-6 SD4 P3.2
CN2-7 SD5 Address Bus
CN2-8 SD6 Address Bus
CN2-9 SD7 Address Bus
CN2-10 SD8 Address Bus
CN2-11 SD9 Address Bus
CN2-12 SD2 NC

5. CD - Contents

- WINISP software
- KEIL Compiler (Evaluation version, 2K code size)
- Sample C codes for Serial to Ethernet conversion, I2C EEPROM.

6. Run your Programs

The **ETM131** main micro controller is 89V51RD2, which has on-chip 64k of flash 1k Ram. The CD provided has the In-System-Programming software WINISP that is to be installed in your computer. To install the WINISP software run the setup provided in the CD. Software flow control (Xon/Xoff) is required for communication. Or the data should be within the maximum buffer size. To Program (download) the hex file in the flash follow the below simple steps:

Download steps

- Connect the Power adaptor to the board (do not switch on).
- Connect the supplied serial cable to the board and the COM1/COM2 of computer
- Press the programming switch (S1) so that it remains in down position.
- Power on the Board (switch the mains supply).
- The green led on board should light up indicating proper power supply.
- The red led should also light up indicating program mode.
- Run the WINISP software.
- Under the parameters heading select the following

  CHIP – 89V51RD2

  PORT – COM1/COM2

  OSC (Mhz) – 12
- Using the LOAD (Alt-L) button load the appropriate HEX File or hello. Hex file provided in CD.
- Click the ERASE BLOCK (Alt-E) button; select the flash memory block to be erased. Click the ERASE! Button, the selected block will flash

with Pink color. Once completed the Block Erase Selection window will close.

- Press the PROGRAM PART (Alt-P) button; wait till the Status Display shows "Programming Flash Successful" is displayed.
- Now close the WINISP software & switch off the mains.
- Press the programming switch (S1) again so it comes in up position.
- Open the hyper terminal if hello. Hex file is loaded & select the baud rate to 9600, Set Data Bits=8, parity bit=None, Echo=Off.
- Switch on the Board power, which will run hello. Hex file displaying the string "Press Enter for configuration" in the hyper Terminal

7. Applications

- **ETM131** can be used to send Serial data to Ethernet and to Explore the 8051 core & as a Test Platform to download the programs to 89V51RD2 flash to run the Program, check the desired output & if required change the program & download it to the microcontroller flash without removing it from the board.
- The Sample C code provided with the **ETM131** module are self explanatory with comments that help you understand the Ethernet module.

7.1 **ETM131**. Download the .hex file of simple keyboard program and open hyper terminal. Configure it for the baud rate of 9600 and after pressing the key different messages are displayed as coded in source code. After recognizing the key pressed in main routine passes only the value of the key and the routine takes the action with respect to the key value. So for further changes to make it more useful the developers have to do few changes in "getkey ()" as per application.

a) Launch the Hyper terminal program.
b) Under "Bits per second", choose " 9600 "
c) Under "Data bits", choose " 8 "
d) Under "Parity", choose " None "
e) Under "Stop Bits", choose " 1 "
f) Under "Flow Control", choose " Software flow control/ Xon-Xoff " or Hardware flow control/CTS-RTS.

g) Flow control: Xon/Xoff or (None if data size is within the maximum buffer size)

7.2 **EEPROM:** Source code for the EEPROM demonstrates how to store the Data in EEPROM by suing I2C protocol. By using this sample code data can be stored and retrieved from EEPROM.